551861

Date; Aug 24,2001

RECEIVED
OCT 10 2001

From: McDonald E. Wrenn, PhD
General Delivery
Dolan Springs, Az. 86441
phone: 520-767-3248
fax none
e-mail archesin@lasal.net
or(most recent) ewrenn@rraz.net

ewrenn@rraz.net

dob: 04/16/36

My detailed resume (40 pages, 1 for approximately each year of experience) is available as hardcopy Unfortunately, my digital resume has been lost from my computer records so that I cannot attach it to an e-mail. However I can overnight the hard copy to you upon reception of your expression of interest .. A synopsis of my qualifications and employment history follows.

current position: Professor of Pharmacology and Director Environmental Radiation and Toxicology Laboratory (U of Utah School of Medicine (on disability leave), Adjunct Prof of Physics, Mesa State College, Co and U. of Utah.From1995 on I was managing a small motel which I owned in Moab, Utah in which I resided. I am currently residing in Az at the address above. Reached mandatory retirement age on 4/16/01.

Past positions and experience:

Director Radiobiology Division, U of Utah, College of Medicine, 1979-march 1986, responsible for overall direction of specialized program of research (staff of 29 including 13 phD's and 3 DVM's)dealing with the experimental investigation of the carcinogenic risks of internal irradiation

Assoc . Professor and Assist. Director, Laboratory for environmental Studies, Institute of Environmental Medicine, NYU Medical Center 1971-1979. Responsible for quantitative gamma spectrometric measurements of environmental samples and whole body counting. Directed radioecological research in aquatic and terrestrial environment. Taught graduate level courses on "radiation hygiene measurements" dealing with both laboratory and field measurements of radioactivity and radiation.

USAEC and USERDA:1973-1975Div. of Biomedical and Environmental Research: biomedical program research administration, responsible for development and review of national program of research (circa $20 million) on the biological effects of internally deposited radioactive material.

Instructor-Assoc. Professor, and asst. Director, Laboratory for Environmental studies, Institute of Environmental Medicine, NYU Medical Center. 1967-1979

USPHS Fellow & graduate Student: Dept. Env. Med, NYU Med Ctrl 961-1967

LTJg, USN: supervised nuclear emergency team training at Defense Atomic Support Agency in Albuquerque, NM and the Nevada Test site. 1958-1961.

Education: Princeton University 1959, AB(Physics, cum laude)
NYU,1 962 MS(sanitary Science/radiological health)
NYU, 1967, PhD (nuclear engineering/environmental medicine)

Board Certifications; Certified by the American Board of Health Physics for the comprehensive practice of Health Physics, 1967

Journal Publications: 96 original publications in peer reviewed journals including Health Physics,Radiation Research, Radiation Protection Dosimetry, Reviews of Mod. Physics, and Nature.

Books and book chapters: 16

Reports and conference proceedings: 76

Oral Presentations to Scientific or Technically oriented Organizations.25

Part time positions and consulting services: 16, including for IAEA, WHO, USNRC,6 nuclear utilities in the northeast US, several beryllium producing companies, and nuclear engineering companies(architech/engineers).

Adjunct Professor of Physics(1966-present)
Mesa State College
Grand Junction, Co.

Special Skills:

1. Analytical laboratory management including quality control
2. Radiation detection instrumentation (laboratory and environmental)
3. Statistical analysis of scientific data (laboratory and environmental).
4. Dose response in radiobiology and environmental toxicology
5. Excellent grant writing & negotiating skills; cumulative awards exceed$25 million

Yucca Mountain :Comments by

McDonald E. Wrenn, PhD. in environmental Health Sciences and Nuclear Engineering
43 years of experience in teaching and research in radiation measurement(and applied health physics), in radiobiology, environmental radioactivity and radioactivity transport. & dose assessment.

Member: American Physical Society study group on nuclear fuel cycles and waste management(see peer reviewed report
Rev. Mod Phys. Vol50, No1., part II, Jan 1978
I do not speak for that study group, as it was disbanded upon completion of its task.

My Position: **I support the Doe process to place a long term spent reactor fuel repository at the Nevada Test Site.**
I believe the decision should be made on the basis of science and engineering, not politics
Employment status: Recently retired.
Reasons: The orderly management of our nuclear power reactors spent fuel is long overdue, the benefits will be positive for us , our children, our grandchildren, the state of Nevada, the U.S., and the world.
Economic benefits to the state long term
Include addition of some financial stability to the Beatty area, which has suffered severely from the economic dislocation caused by shutdown of the gold mining activities there.
4. Place nuclear electric power generation on a surer foundation assuring greater electric supply for the US.
5.Help the US to deal in a more orderly manner with the problem of dwindling fossil fuel reserves and other resources
6. Restore this citizens faith in the ability of the federal government to manage waste for the long term, an activity the government said is too important to be taken on by any other organization.
7. Restore the credibility of the U.S. govt. abroad in nuclear energy and energy development
8. If the US senate had not overwhelmingly rejected the Kyoto treaty on limiting Co2 emissions to the atmosphere, its implementation would require shutting down all coal burning electricity generating plants in the U.S. If global warming continues we may yet face a curtailment in fossil generated electricity. Then it will be advantageous to have the nuclear electric generating option to mitigate widespread economic disemployment and distress.

Some important concepts:

1.**No radiation can leave the repository, only radioactive atoms.**

2.**The only credible way for significant amounts of radioactivity to eventually leave the repository site is by hydrogeologic transport.**

And the rate of transport of the radionuclides will be much slower than the convective rate of water flow except for heavy hydrogen-3 called tritium which will move at the rate of normal water. The amount of Tritium will be limited due to the small yield in nuclear fission, and radioactive decay during transport with a half life of 12 years (tenth life 40 years)

The hydrologic transport of all other radionuclides will be significantly impeded by such phenomena as ion exchange on particle or mineral surfaces

Ranges of different radiations.

Alpha--- sheet of paper, dead layer of human skin
beta about 6 feet in air, less than an inch in rock or soil
gamma mean free path in air, about a football field length, in rock less than several feet.

Useful conversion factor:
3.3x(half life)= tenth life
half life is the time required for half of a pure radioactive isotope to decay. In a tenth life 90% decays. The longest lived fission products are Sr-90 and Cs-137 with half lives of about 30 years and tenth lives of a century. Thus in 2 centuries only 1% of the Sr-90 will remain as radioactive and in 6 centuries one one millionth. In spent reactor fuel, the long term hazard is dominated not by fission products but by radionucli des also found naturally such as Ra-226

Rather than obdurate opposition, the people of Nevada would be in a good position to ask the Federal Govt. for something in return if the repository is sited here. Your talented and well placed senators and congressmen could certainly craft legislation to return ownership of most of the State from the Federal Govt. back to the State and its people

Although my opinion is not probably shared by most people here, let us agree to disagree and agree not to be disagreeable.
McDonald E. Wrenn
09/05/01.
09/12/01 and 9/24/01:**Amargosa Valley** I have spent the whole of the weekend before last reading the preliminary site evaluation study and analyzed what would happen if the engineered safeguards were not

taken credit for, as per the recommendation of the APS study a quarter century ago. The graph reproduced here is from the APS study and shows the ingestion hazard of the lwr wastes w/o reprocessing expressed as volume of water required to reduce the activity to the water concentration limits as per 10 CFR20.I have also put on the horizontal axis. The transport time required for the first waste to arrive in Amargosa valley, as taken from the PSES.I have only included transport time through the unsaturated zone followed by the time to travel laterally through the saturated zone including alluvium to a receptor 18 miles down gradient (the underground hydrological equivalent of downstream). I also read that in the" Saturated zone radionuclide transport model", 1997. The time to breakthrough fractions in the unsaturated zone is1000 to 10000 years. I chose 1000. And the transport time laterally through the saturated zone as 1300 years. This total transport time through the unsaturated and saturated zone gives a decay of 10^23 which is sufficient to reduce the important fission products Sr-90 and Cs-137 by radioactive decay to trivial levels.

However in the long term The actinide precursors (isotopes of Pu,Cm, Am and U) and **of Ra-226 will decay into Ra-226 and produce a low level contamination of groundwater in part of the death valley basin which would lead to doses from water ingestion equal to 2 to 3% of the natural background** total effective dose equivalent of about 360mrem/yr(tede-natural background).This peak occurs well into the future 100,000 to 1 million years after emplacement. The report states that the groundwater in the region is confined within the closed death valley basin and escapes only through evaporation or plant transpiration.No surface or groundwater flows out of the basin. This is **good news** and **bad news** The good part is **that other aquifers including the surficial colorado river cannot be contaminated.**

The bad news is that the death valley aquifer will be beginning after10,000 years more or less permanently contaminated, but the doses resulting from that are a small fraction of natural background and equal roughly to the variation in natural background from moving to a home 1000 feet higher or taking one transcontinental airplane flight, or even moving down the street or from one town to another. For example the naturally occurring external exposure rate in Beatty at the post office monitoring station (on Sept 17)is 5.2uR/hr higher than the station in the amargosa valley at a swimming pool. Since 1uR/r equates to 8.5mrem/yr ede the different external exposure rate due to naturally occurring radioactivity is5.2x8.5=**44.2 mrem/yr,** a variation at least 3x larger than could or should be produced by the waste repository long into the future Substantial populations live in high natural radiation background areas in India and Brazil where the backgrounds exceed 10x those normal for the rest of the world, without any apparent harm.

reactors **This aquifer contamination could be significantly reduced by co-locating a fuel reprocessing plant and mixed oxide fuel fabrication plant and burning the fissionable actinides in power .reactors** The justification would be Pu destruction and disarmament, with the permanent destruction of about 23 kg of Pu-239 per Gwe-yr, enough possibly to make several small nuclear weapons. This would also have the effect of expanding the fissile lwr fuel supply by 150% although it might not be as economical as mining and enriching natural uranium. Experience in France under IAEA supervision has shown such operations can be carried out safely without diversion of Pu to undesirable uses.

French scientists say that lwr power reactor produced Pu is not weapons grade anyway. The large **100+ US power reactor network could be used to destroy as much Pu as necessary,** But the recycle fuel would probably have to be a government program and co-located at the NTS. Recycle could reduce the Ra-226 in wastes by a factor of 6(p.s110, APS, TABLE 7B1) Thus international safeguards could be expedited at great speed and significant contamination of the death valley aquifer could be avoided.

The period of retrievability planned is 100 years so that the current repository could proceed as designed while plans for reprocessing and recycle fuel fabrication were developed Senator Ensign, your political leadership is needed hereto overcome the legal, political, institutional and financial impediments' perhaps you can enlist the cooperation of Senator Reed. If you can pull off the political end perhaps there is a nobel peace prize at the end. Good luck. You will have many scientists and engineers behind you. **Let's destroy plutonium not bury it.** There will be a great deal of international support for your effort.
In short I believe the proposed repository design is safe but could be made safer
by adding a co-located reprocessing + mixed oxide fuel fabrication plant to allow destruction of Pu in nuclear power production. And hence reduce the longer lived contaminants added to the death valley basin aquifer.

Basis of hydrogeological transport time of 1000 years used for my evaluation of holdup during transport through the saturated zone down gradient to the Amargosa Valley. The" Saturated Zone Radionuclide Trabsport Model", 1977 which states that:."Transport times to a hypothetical 5 km compliance point are on theorder of a few thousand years" " Therefore my use of 1000 years for transport to 18 km the nearest point of exposure to ground water,is very conservative (ie, a gross underestimate).

Short physics lesson: When a shorter lived radionuclide decays into a longer lived radionuclide such as Pu-238 into U-234 the radioactivity of the daughter decreases at least in proportion to their respective half lives

But of course the longer lived daughter is more persistent, ie sticks around longer.

IAEA- International Atomic Energy Agency in Vienna Austria.

Lwr- light water nuclear power reactors

CFR- Code of Federal Regulations

APS-American Physical Society

10^23 means 1 followed by 23 zeros. It is equivalent to a tenth of a million, million, million,million.

Tede means total effective dose equivalent which from natural background is about 360 mrem/year to a typical U.S. Citizen

mrem means millirem---milli means 1/1000 so that a millirem is 1/1000 rem

Rem is a unit of effective dose equivalent, which is valid for all types of radiation under consideration here(alpha, beta, and gamma)and is added up over all organs exposed and weighted to include the radiosensitivity of each organ

Pu- the chemical symbol for element#94, plutonium

Am-the chemical symbol for element #95, americium

Cm-the chemical symbol for element 96, curium

551861

natural radiation effective external dose equivalent from the cemp monitoring network on July17,2001 9/20/013:27 PM

Pressurized Ion Chambers

	E	F	G	H	I
63			gamma		hrs/yr
64	dose equiv	**1uR/hr=**	**8.50**	**mrem/yea**	8760
65	beatty-overto	8 uR/hr=	67.98		
66	beatty-amarg	5.2uR/hr	44.19		
67	beatty	17.7uR/hr	150.40		

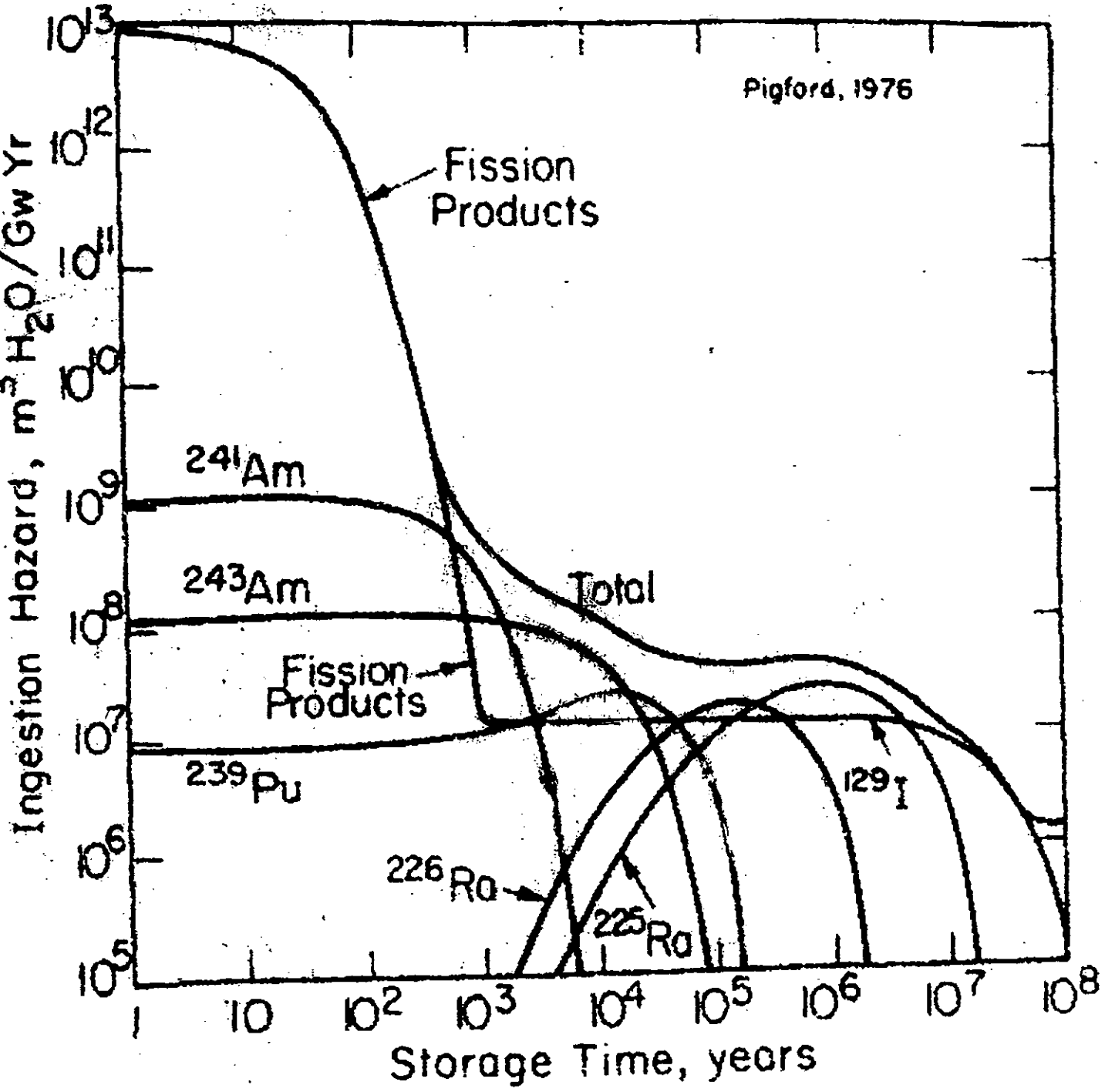

FIG. 7B1. Principal contributions to the ingestion hazard inde at HLW from the reprocessing of a uranium fueled LWR as a function of time.

← minimum hydrological transport time to repository → Amargosa Valley (US DOE) 2×10^3

assumes no holdup by the engineered safeguards or the waste container.